REMARKS

The present response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Applicants assert that the present invention is new, non-obvious and useful. Prompt consideration and allowance of the claims is respectfully requested.

Status of Claims

Claims **26-45** and **47** are pending in the application.

Claims **26-45** and **47** have been rejected.

CLAIM REJECTIONS

35 U.S.C. § 112 Rejections

In the Office Action, the Examiner rejected claims 26-45 and 47 under 35 U.S.C.§ 112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner stated that "successive frames each having a predetermined time period which is sufficiently short that an average reflectance of the color LCD apparatus over the predetermined time period is perceived without the appearance of visual flicker" is not described in the specification.

Applicants respectfully disagree and traverse the rejection at least in view of the remarks that follow. This element of the claims has ample support basis in the application as filed, at least at the following portions of the specification:

> [0009] For practical purposes, a synthetic perceivable gray level can be maintained by "managing" the location with a predetermined duration in the Homeotropic State (induced nematic), a predetermined duration in the planar state, and remaining fractional duration's in transition between planer and

Homeotropic States or between Homeotropic and planar states. Simply stated, a 50% gray level would require about 50% of the time in Homeotropic State and about 50% of the time in planar state. Nevertheless, care is advised in selecting the frequency of the duration fragments in each state so that there is little or no appearance of visual flicker--gray level instability or fluctuation.

* * *

[0018] . . . For example, gray levels may be specified using fixed voltage pulses of predetermined duration and using variable frequency. This permits maintaining stable frequency signature reflectivity from the perspective of an observer who perceptually averages a plurality of millisecond time slots into a single gray level or color setting. It is especially facile for an apparatus, according to the present invention, to allow the observer to perceptually average transparent states with reflective states; thereby facilitating observation of time averaged intermediate states. Substantially, this technique facilitates video frame rates; with full freedom to simultaneously set and maintain a broad variety of gray levels.

* * *

[0050] To implement this regime the cell must have a sustaining voltage applied to the areas that need to be Homeotropic. Gray levels can be accomplished by for example dividing the time-period of a frame into several parts and addressing the pixel such that it is Homeotropic for a limited period only. The eye averages out this dithering such that it sees only a partial reflectance value rather than the full reflectance value; i.e. it sees a gray level. This can be done for each color. . .

* * *

[0057] Furthermore, according to the preferred embodiment of the instant method, selecting a state is in accordance with the gray level and the selecting is a time domain dithered mixture of planar and Homeotropic States. In the present context, time domain dithering relates to selecting the frequency of the duration voltage driving fragments (components of AC, bDC, tbMC, combinations, or the likes--as defined above) in each state so that there is little or no appearance of visual flicker--gray level instability or fluctuation.

Accordingly, it should be clear that there is sufficient written description to support the claims.

Indeed, in the Advisory Action mailed August 12, 2008, the Examiner already indicated that the rejection under Section 112 has been withdrawn on the basis that the remarks presented in Applicants' response dated July 18, 2008 were persuasive. Applicants respectfully request that the rejection be withdrawn.

It should be noted that the only change between the currently pending claims and the claims considered at that time (then set out as claim 46) does not affect the validity of those arguments in any way. In particular, only a minor change has been made regarding the definition of driving of the cholesteric liquid crystal material into the planar and homeotropic states in a predetermined period. Whereas the previously pending claim referred to driving the material into the planar and homeotropic states "in a predetermined period" the currently pending claims refer to driving the material into the planar and homeotropic states "within successive frames each having a predetermined period."

The passages of the specification quoted above (and previously considered persuasive) must be understood – indeed, can only be understood – as meaning that the cholesteric liquid crystal material is driven into the planar and homeotropic states in successive frames having the predetermined period. Otherwise, the claimed result of providing an average reflectance of the color LCD apparatus over the predetermined time period would only be achieved for a single time period, which, being typically of the order of 20ms, would be an insignificant time period to be "perceived without the appearance of visual flicker."

It should furthermore be noted that paragraph [0018], quoted above, refers "video frames" (as does paragraph [0014] of the application. This disclosure clearly teaches driving the cholesteric liquid crystal material into the planar and homeotropic states occurring in successive frames.

Thus, it is clear that the above sections of the specification support driving the material "within successive frames each having a predetermined time period which is sufficiently short that an average reflectance of the color LCD apparatus over the

predetermined time period is perceived without the appearance of visual flicker," as recited in claim 26.

In the Office Action, the Examiner further rejected claims 26-45 and 47 under 35 U.S.C.§ 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants respectfully disagree and traverse the rejection at least in view of the remarks that follow. This element of the claims is definite and particularly points out and distinctly claims the subject matter which applicant regards as the invention.

In particular, the Examiner has inquired (a) how short the predetermined time period is for each successive frame, and (b) how the average reflectance over a predetermined time period is measured.

In response to the first inquiry, the claims define with sufficiently clarity the answers to these questions. Specifically, the successive frames each have a predetermined time period that is sufficiently short that an average reflectance of the color LCD apparatus over the predetermined time period is perceived without the appearance of visual flicker. This is sufficiently clear to those of skill in the art. Within the technical field relevant to the present invention, it is understood that LCD displays available today do not seem to flicker, insofar as the backlight of the screen operates at a sufficiently high frequency.

Regarding the examiner's second question of how the average reflectance is measured, this functional definition in fact requires that the average reflectance "is perceived without the appearance of visual flicker". This is easily understood by a person having ordinary skill who understands that human vision cannot perceive changes occurring above a certain rate, as discussed above. This is the same physiological effect that causes any display to be perceived as providing a motion image even though it in fact displays a series of static images. This is a fundamental part of the technology of displays of which the skilled person has extensive knowledge. One of ordinary skill in the art would have a sufficiently definite understanding of the measurement of average reflectance, and the basics of visual flicker to definitely understand the scope of the invention as claimed.

35 U.S.C. § 103 Rejections

In the Office Action, the Examiner rejected claims 26-35, 37, 38, 40-45, and 47 under 35 U.S.C. § 103(a), as being unpatentable over Yuan et al. (US Patent 6,317,189) in view of Kim et al. (US Patent 7,205,970). Applicants traverse the rejection for at least the reasons that follow.

The Yuan reference discloses:

> A reflective display comprises a pair of substrates and a holographic polymer dispersed cholesteric liquid crystal (HPDCLC) material formed between the substrates. The holographic polymer dispersed cholesteric liquid crystal material comprises a holographic polymer dispersed liquid crystal material and a cholesteric liquid crystal material. These two materials reflect one or more different intrinsic colors such that individual cells of the display can reflect one or more different intrinsic colors. The cells can comprise more than two layers, with each layer being reflective of a different intrinsic color. The cells in such embodiments can reflect three different intrinsic peak wavelengths and one or more intrinsic colors, enabling the display to reflect all colors. (Abstract).

The Examiner concedes that the Yuan reference does not teach "the electrical pulse driving means being arranged to supply drive signals which provide a predetermined grey level by driving the cholesteric liquid crystal material, within successive frames each having a predetermined time period which is sufficiently short that an average reflectance of the color LCD apparatus over the predetermined time period is perceived without the appearance of visual flicker, into homeotropic state in a fraction of said predetermined time period and into the planar state in the remainder of said predetermined time period, said fraction being selected in accordance with the grey level," as recited in claim 26.

For this element of claim 26, the Examiner cites to the Kim reference. However, the Kim reference relates to an entirely different type of liquid crystal, namely Twisted Nematic (TN) liquid crystal, or in the example provided, electrically controlled birefringence liquid crystal (ECB) (see col. 1 lines 15-18). Specifically, the teachings of the Kim reference apply only to those liquid crystal displays that use polarisers, wherein grey scale inversion occurs when the viewer looks along the optic axis of the liquid crystal at some angle. At this point,

some complex optics arise associated with elliptically polarized light which compensation films try to recover. This is a well-known and common problem that limits the viewing angle, and therefore, the Kim reference attempts to overcome this problem in order to obtain a wide viewing angle.

In particular, because compensation films are expensive, the Kim reference teaches that the problem may be overcome by a combination of spatial and temporal dithering using two or more grey levels whose time average gives the grey level required when viewed at some wide angle of view. The Kim reference teaches that this is done to avoid having the molecules of the liquid crystal held at the position at which (or beyond which) inversion occurs. Thus, different spatial pixels are held at different grey levels to achieve otherwise impossible grey levels at wide angles of view.

In contrast, the present claims are directed to a cholesteric liquid crystal, to which the teachings of the Kim reference are inapplicable. It would not have been obvious to apply the teachings of Kim to the display of Yuan in order to solve the problem tackled by Kim relating to grey scale inversion, because this problem simply does not occur in the display of Yuan, due to use of cholesteric material and due to the absence of polarisers in Yuan. There would therefore have been no reason for one of ordinary skill in the art to have combined the solution of the Kim reference to the problems of Twisted Nematic crystal displays to the cholesteric liquid crystal display described in the Yuan reference.

The motivation provided by the Examiner ("include the idea of Kim et al. of suppressing the occurrence of flicker") is therefore not technically sound. When the Kim reference discusses flicker, it is concerned with flicker caused by the effects of a swing of the common electrode voltage, or a difference of response time of the liquid crystal (col. 2, lines 6-50). However, both of these effects are specific to TN (twisted nematic) type liquid crystal. In each case, the TN liquid crystal is driven in successive frames by the same voltage, but there is a variation in the common electrode voltage or the response time of the liquid crystal.

In particular, the TN liquid crystal in the Kim reference is driven in an entirely different manner from the cholesteric liquid crystal in the Yuan reference to achieve grey levels based on a different physical effect. That is, the drive voltage in the Kim reference alters the polarization direction of the TN liquid crystal relative to a polarizer. In contrast,

and as described in the previous response dated July 18, 2008, Yuan discloses driving the cholesteric liquid crystal into two different states the planar and focal conic states (via the homeotropic state). This driving of the cholesteric liquid crystal display device of the Yuan reference is not affected by the causes of flicker in Kim's TN liquid crystal, namely, a swing of the common electrode voltage, or a difference of response time of the liquid crystal. Neither of these effects would have affect the resultant state of the cholesteric liquid crystal in the Yuan reference. Even with a swing of the common electrode voltage or a change in the response time of the liquid crystal, the cholesteric liquid crystal in Yuan et al. would still be driven into the same planar or focal conic states.

Thus, one or ordinary skill in the art would have understood that the effects alleged to cause flicker in the TN liquid crystal display of the Kim reference do not cause flicker in the cholesteric liquid crystal display device of the Yuan reference. Therefore, there would have been no reason for one of ordinary skill in the art to have applied a solution in a TN crystal to the cholesteric liquid crystal of the Yuan disclosure.

In view of the foregoing amendments and remarks, the pending claims are deemed to be allowable. Their favorable reconsideration and allowance is respectfully requested.

Should the Examiner have any question or comment as to the form, content or entry of this Amendment, the Examiner is requested to contact the undersigned at the telephone number below. Similarly, if there are any further issues yet to be resolved to advance the prosecution of this application to issue, the Examiner is requested to telephone the undersigned counsel.

Please charge any fees associated with this paper to deposit account No. 50-3355.

Respectfully submitted,

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